

WEB ACCESSIBILITY SERVICE APPARATUS AND METHOD

BACKGROUND OF THE INVENTION

5 **1. Technical Field:**

 The present invention is directed to an improved data processing system. More specifically, the present invention is directed to an apparatus and method for providing web accessibility services.

10 **2. Description of Related Art:**

 As the ADA becomes widely applied to Internet Web sites and other online properties, accessibility to these Internet Web sites, by persons having a different set of abilities becomes mandated by law. Online service providers and electronic businesses (e-businesses) need help in meeting these requirements and ensuring that
15 they serve all their customers. As Web sites begin to differentiate themselves based on service, online businesses that offer service tailored to the customer's needs are more likely to be favored by customers with disabilities, or customers with a different set of abilities, than those Web sites that do not offer such tailored service. Until
20 now, the industry has focused on designing shrink-wrapped client-side accessibility solutions ranging from screen-readers to self-voicing Web browsers like IBM Home Page Reader™ (HPR). IBM Home Page Reader™ is an IBM product that turns Internet Explorer into a talking browser.

 Selling shrink-wrapped solutions like HPR into the support-intensive accessibility market at an affordable price is a difficult proposition. Products like
25 IBM's Via Voice™, which uses speech recognition to type documents, for example, may be very helpful to people that cannot move or are otherwise unable to use a keyboard. Because Via Voice™ is relatively cheap, and the market of persons having special needs is relatively small when compared to the overall market, selling the Via Voice™ application to mobile-impaired users as a client end product is not a
30 profitable venture. For this reason, companies that sell speech recognition products

are not given an incentive to market their products to a relatively small market of mobile-impaired users.

Thus, it would be beneficial to have an apparatus and method for providing accessibility products to persons having special needs that is both relatively cheap for
5 the end user as well as profitable for the supplier of the accessibility product.

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SUMMARY OF THE INVENTION

- 5 Today's mainstream Internet, such as the World Wide Web, is characterized by the user agents being free, with revenue being made primarily on the server-side. This business model can be applied to providing Web accessibility to persons with special needs as a service. The present invention makes use of this model to provide a Web accessibility apparatus and method to users having special needs.
- 10 The accessibility service provider provides expertise on accessible information design along with technology offerings like speech tools. However, instead of selling this expertise, information and technology as a packaged one-time, one-size fits all solution, the present invention provides an accessibility service based on a per-access revenue model.
- 15 With such a per-access revenue model, a services provider may offer accessibility as a service to major content providers. As an example, major airlines may use the present invention to contract with an accessibility service provider to provide an access friendly view of their Web site. Under such a contract, the accessibility service provider may be paid, for example, based on the number of hits
- 20 received by the accessibility service provider. For example, a company may supply speech recognition to mobile-impaired users through an accessibility services provider such that profit is generated not through the purchase of the speech recognition product, but rather when the product is used, through the accessibility services provider, to browse the Internet.
- 25 Payment may be received not just through the Internet. A mobile-impaired user may order a movie on the television, or browse through different channels through the use of speech recognition technology and voice commands. In these cases, a television or cable company may contract with the accessibility services provider to pay the accessibility service provider for the use of a service that adds

customers that otherwise may not use the product sold by the television or cable company.

5 In another example, a hearing impaired person may use an accessibility service provider that consists of speech recognition or a human operator, to call a store and order goods. In such a case the store or company may pay the service provider that allowed the transaction to exist.

10 In view of the above, the present invention provides an accessibility service apparatus and method for providing an accessibility service to users so that these users may gain access to content on a data network, such as the Internet. The apparatus and method provide a mechanism by which a user may request content from the data network from a content provider. The request for content may then be intercepted by an intelligent agent on the user's client device, a proxy server, or the like, which redirects the request to a mirror content provider. The mirror content
15 provider provides the same content as the original content provider however, it is formatted for use with one or more accessibility tools.

The requested content is then transmitted from the mirror web site to the intelligent agent, or proxy server, where the content is then input to an accessibility tool. The accessibility tool performs various functions, depending on the type of
20 accessibility tool, to generate a modified content output that is tailored to the specific needs of the user. For example, the accessibility tool may be a screen reader tool that reads the text presented on the client device display so that a visually impaired user may be informed of content being displayed.

The present invention further includes mechanisms by which the provider of
25 the accessibility tool is compensated for the user of the accessibility tool. In a preferred embodiment, a fixed fee, or a portion of the revenue generated by a user using the accessibility tool is reapportioned to the provider of the accessibility tool. For example, if a user makes use of an accessibility tool to select a banner ad on a web page, the web site providing the banner ad is paid a fee from the owner of the
30 banner ad and a portion of that fee may be redirected to the provider of the

accessibility tool. The transfer of such funds may be performed in any known manner, such as by electronic fund transfer, mail, or the like. Other features and advantages of the present invention will be described in, or will become apparent to those of ordinary skill in the art in view of, the following detailed description of the

5 preferred embodiments.

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BRIEF DESCRIPTION OF THE DRAWINGS

5 The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

10 **Figure 1** is an exemplary block diagram of a network data processing system in which the present invention may be implemented;

Figure 2 is an exemplary block diagram of a server in accordance with the present invention;

15 **Figure 3** is an exemplary block diagram of a client device in accordance with the present invention;

Figure 4 is an exemplary block diagram illustrating a methodology of the present invention;

Figure 5 is an exemplary block diagram of the accessibility service;

20 **Figure 6** is an example implementation of the present invention when used by visually impaired people;

Figure 7 is an example implementation of the present invention when used by a paralyzed person;

Figure 8 illustrates an exemplary agreement database in accordance with the present invention;

25 **Figure 9** is an exemplary diagram for illustrating how a contractor may use the agreement between the service provider and the supplier that provides access to services according to a payment scheme; and

Figure 10 is a flowchart outlining an exemplary operation of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

5 With reference now to the figures, **Figure 1** depicts a pictorial representation of a network of data processing systems in which the present invention may be implemented. Network data processing system **100** is a network of computers in which the present invention may be implemented. Network data processing system **100** contains a network **102**, which is the medium used to provide communications links
10 between various devices and computers connected together within network data processing system **100**. Network **102** may include connections, such as wire, wireless communication links, or fiber optic cables.

In the depicted example, a server **104** is connected to network **102** along with storage unit **106**. In addition, clients **108**, **110**, and **112** also are connected to network
15 **102**. These clients **108**, **110**, and **112** may be, for example, personal computers or network computers. In the depicted example, server **104** provides data, such as boot files, operating system images, and applications to clients **108-112**. Clients **108**, **110**, and **112** are clients to server **104**. Network data processing system **100** may include additional servers, clients, and other devices not shown. In the depicted example,
20 network data processing system **100** is the Internet with network **102** representing a worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers, consisting of thousands of commercial, government, educational and other computer
25 systems that route data and messages. Of course, network data processing system **100** also may be implemented as a number of different types of networks, such as for example, an intranet, a local area network (LAN), or a wide area network (WAN). **Figure 1** is intended as an example, and not as an architectural limitation for the present invention.

Referring to **Figure 2**, a block diagram of a data processing system that may be implemented as a server, such as server **104** in **Figure 1**, is depicted in accordance with a preferred embodiment of the present invention. Data processing system **200** may be a symmetric multiprocessor (SMP) system including a plurality of processors **202** and **204** connected to system bus **206**. Alternatively, a single processor system may be employed. Also connected to system bus **206** is memory controller/cache **208**, which provides an interface to local memory **209**. I/O bus bridge **210** is connected to system bus **206** and provides an interface to I/O bus **212**. Memory controller/cache **208** and I/O bus bridge **210** may be integrated as depicted.

Peripheral component interconnect (PCI) bus bridge **214** connected to I/O bus **212** provides an interface to PCI local bus **216**. A number of modems may be connected to PCI bus **216**. Typical PCI bus implementations will support four PCI expansion slots or add-in connectors. Communications links to network computers **108-112** in **Figure 1** may be provided through modem **218** and network adapter **220** connected to PCI local bus **216** through add-in boards.

Additional PCI bus bridges **222** and **224** provide interfaces for additional PCI buses **226** and **228**, from which additional modems or network adapters may be supported. In this manner, data processing system **200** allows connections to multiple network computers. A memory-mapped graphics adapter **230** and hard disk **232** may also be connected to I/O bus **212** as depicted, either directly or indirectly.

Those of ordinary skill in the art will appreciate that the hardware depicted in **Figure 2** may vary. For example, other peripheral devices, such as optical disk drives and the like, also may be used in addition to or in place of the hardware depicted. The depicted example is not meant to imply architectural limitations with respect to the present invention.

The data processing system depicted in **Figure 2** may be, for example, an IBM RISC/System 6000 system, a product of International Business Machines Corporation in Armonk, New York, running the Advanced Interactive Executive (AIX) operating system.

With reference now to **Figure 3**, a block diagram illustrating a data processing system is depicted in which the present invention may be implemented. Data processing system **300** is an example of a client computer. Data processing system **300** employs a peripheral component interconnect (PCI) local bus architecture. Although the depicted example employs a PCI bus, other bus architectures such as Accelerated Graphics Port (AGP) and Industry Standard Architecture (ISA) may be used. Processor **302** and main memory **304** are connected to PCI local bus **306** through PCI bridge **308**. PCI bridge **308** also may include an integrated memory controller and cache memory for processor **302**. Additional connections to PCI local bus **306** may be made through direct component interconnection or through add-in boards. In the depicted example, local area network (LAN) adapter **310**, SCSI host bus adapter **312**, and expansion bus interface **314** are connected to PCI local bus **306** by direct component connection.

In contrast, audio adapter **316**, graphics adapter **318**, and audio/video adapter **319** are connected to PCI local bus **306** by add-in boards inserted into expansion slots. Expansion bus interface **314** provides a connection for a keyboard and mouse adapter **320**, modem **322**, and additional memory **324**. Small computer system interface (SCSI) host bus adapter **312** provides a connection for hard disk drive **326**, tape drive **328**, and CD-ROM drive **330**. Typical PCI local bus implementations will support three or four PCI expansion slots or add-in connectors.

An operating system runs on processor **302** and is used to coordinate and provide control of various components within data processing system **300** in **Figure 3**. The operating system may be a commercially available operating system, such as Windows 2000, which is available from Microsoft Corporation. An object oriented programming system such as Java may run in conjunction with the operating system and provide calls to the operating system from Java programs or applications executing on data processing system **300**. "Java" is a trademark of Sun Microsystems, Inc. Instructions for the operating system, the object-oriented operating system, and applications or programs are located on storage devices, such as hard disk drive **326**, and may be loaded into main memory **304** for execution by processor **302**.

Those of ordinary skill in the art will appreciate that the hardware in **Figure 3** may vary depending on the implementation. Other internal hardware or peripheral devices, such as flash ROM (or equivalent nonvolatile memory) or optical disk drives and the like, may be used in addition to or in place of the hardware depicted in **Figure 3**. Also, the processes of the present invention may be applied to a multiprocessor data processing system.

As another example, data processing system **300** may be a stand-alone system configured to be bootable without relying on some type of network communication interface, whether or not data processing system **300** comprises some type of network communication interface. As a further example, data processing system **300** may be a Personal Digital Assistant (PDA) device, which is configured with ROM and/or flash ROM in order to provide non-volatile memory for storing operating system files and/or user-generated data.

The depicted example in **Figure 3** and above-described examples are not meant to imply architectural limitations. For example, data processing system **300** also may be a notebook computer or hand held computer in addition to taking the form of a PDA. Data processing system **300** also may be a kiosk or a Web appliance.

With the present invention, a user of a client device, such as client device **300**, may obtain accessibility tools to aid the user of the client device to access content on the data network. The user of the client device may, for example, enter an address for a web page that is of interest to the user in a web page request through a web browser application of the client device. The address may be intercepted by an applet on the client device, or a proxy server, along with an identifier indicating the type of accessibility tool that the user requires. The accessibility tool identifier may be incorporated in a data packet header of the data transmission of the web page address to the applet or proxy server.

The applet/proxy server receives the web page address from the client device and identifies an accessibility tool to be provided to the client device to aid the user in obtaining the content from the requested web page. The identification may be based

on the accessibility tool identifier and information stored in an accessibility tool database, as described in more detail hereafter.

The accessibility tool is then provided to the client device for use with the client device's session with the requested web page. The accessibility tool may be provided, for example, by redirecting the web page request to a mirror web site. The mirror web page is a web page that provides the same content as the requested web page but is configured for use with one or more accessibility tools. The web page from the mirror web site may be transmitted to the proxy server/applet which then applies the required accessibility tool to the web page before providing the content of the web page to the user via the client device.

Once the session with the web site is concluded, the applet/proxy server may determine an amount of funds to be paid to the supplier of the accessibility tool based on the types of transactions performed by the user using the accessibility tool. For example, if a user used the accessibility tool to select a banner ad on the web page, and the web page provider is paid 1 cent for each selection of the banner ad from their web page, a portion of the 1 cent may be paid to the accessibility tool provider as consideration for providing an additional user that otherwise may not have had access to the web page or the banner ad. In this way, the supplier of the accessibility tool is able to provide an accessibility tool to a user at no cost to the user while still be compensated for the use of their accessibility tool by those who benefit from the user's use of the accessibility tool.

Figure 4 is an exemplary block illustrating an exemplary methodology of the present invention. As shown in **Figure 4**, a user **400** with special needs, or a different set of abilities, requires assistance in working with the data network. This may be a paralyzed, visually impaired, hearing impaired person, or the like. The user **400** may also have learning disabilities that prevent the user from reading, writing, or typing well. Module **401** represents that the user **400** requires access to an accessibility service. For example, a visually impaired person may require an accessibility service to aid the visually impaired person with reading content displayed on a computer screen. Such an accessibility service may be required for the disabled person to gain

access to content on the data network, e.g., the Internet, and to interact with content providers to make purchases.

For a hearing impaired person, for example, this access 401 may be calling a store. For a paralyzed person this access 401 may symbolize the ability to turn on a computer, access the Internet, and make purchases online. For a person with dyslexia the access 401 may symbolize the ability to read a product description on the Internet that will assist with making a purchase.

Module **402** represents the accessibility services that a person with disabilities may require. These services may include access to the Internet, shopping at a store, access to a device, such as a television, a computer, a car, or the like. An accessibility tool **403** gives a user access to services, information or to a particular device. The accessibility tool **403** is the device or service that is designed for use by disabled persons to aid them in working with content providers on the data network. Such accessibility tools are used to compensate for the fact that the user has a different set of abilities from that of the majority of users.

The accessibility tool **403** may be implemented in hardware, software, or a combination of hardware and software. The accessibility tool may be, for example, a plug-in device to a web browser application on a user's computer, an applet downloaded to the user's computer, a tool accessible to the user via a server, or the like.

The accessibility service provider **404** has many functions as described in greater detail hereafter. In short the accessibility service provider **404** provides a interface through which a user may obtain the assistance of an accessibility tool **403**. In addition, the accessibility service provider **404** monitors how a user utilizes the accessibility tool **403** in order to obtain information related to revenue generated by the user of the accessibility tool **403**. The accessibility service provider **404** further determines who provided the accessibility tool **403** that allowed the person to access the content, i.e. services, information, or devices, on the data network.

The accessibility tool 403 and the accessibility service provider 404 may be
30 provided by the same server in the data network or by separate servers. Furthermore,

the accessibility tool **403** may be provided in a user's computer while the accessibility service provider **404** is provided in a server of the data network. The only limitation to the configuration of the present invention is that the accessibility tool **403** and the accessibility service provider **404** must be able to communicate information to one another.

Examples of the accessibility tool **403** include automatic speech recognition, a screen reader, Accessible WebCite™, an intelligent agent, and the like, that allow for different types of accessibility on a user's client device, e.g. personal computer. Several examples of accessibility tools are given in U.S. Patent Application No.

_____(Attorney Docket No. YOR9-2000-0667), entitled "Universal Web for Helping People with Disabilities (PwD) to Access Computer Tools/Applications," filed on November 29, 2000, which is hereby incorporated by reference.

The accessibility service provider **404** has the ability to determine the supplier of the accessibility tool **403**. Module **405** represents the companies and websites that supply the accessibility tools. The accessibility service provider **404** monitors which tools were used by the user and produces a payment scheme for the supplier of that particular accessibility tool for the service rendered. The payment scheme may be based on contractually agreed to terms between the accessibility tool supplier and the accessibility service provider **404**, for example.

Figure 5 is an exemplary block diagram illustrating an accessibility service provider, such as accessibility service provider **404** in **Figure 4**, according to the present invention. The accessibility service provider according to a preferred embodiment of the present invention is implemented in a server of a data network. The accessibility service provider includes a controller **500** that controls the various functions of the accessibility service provider. The controller **500** is coupled to a tracking service device **503** that has access to a supplier database **504** storing information pertaining to the suppliers of accessibility tools. The tracking service device **503** also has access to an accessibility tools database **505** that stores information pertaining to the available accessibility tools.

The controller **500** is also coupled to an agreement database **506** that stores information pertaining to all of the organizations that have made an agreement with the controller **500** that they will receive payment for providing particular access services on a per-use basis. For example, the company that makes a speech

5 recognition system may have a contract with the controller **500** that if the speech recognition system is used by persons with disabilities for a particular transaction over the data network, e.g., accessing a banner ad of a web page, then the company will receive a certain percent of the proceeds of the transaction for use of the speech recognition service.

10 The controller **500** further has access to indicators of the services/tools/providers **507** that the user accesses through use of the accessibility service provider. The indicators **507** identify the character of a certain access by the user. For example, the indicators **507** may include indicators identifying that the access was provided to a person with disabilities, that the person made use of a

15 particular accessibility tool to access content, the providers of the content accessed, and the like.

The controller **500** is further coupled to a payment service device **502**. The payment service device **502** makes payment to the supplier of the accessibility tool on the basis of the accessibility tool being used by a disabled user to access content. For

20 example, after checking the indicator **507** that an accessibility tool was used, the controller **500** checks the agreement database **506** to determine whether the accessibility tool was provided according to an agreement. If so, then the controller **500** makes a payment to the supplier of the accessibility tool according to the agreement in the agreement database. Such payment may be performed in any known

25 manner. In a preferred embodiment, such payment is performed by electronic transfer of funds to an account associated with the accessibility tool supplier.

The controller **500** also has access to the contractor of services device **508** that finds services and accessibility tools that are not yet covered by the accessibility tools database **505** but that provide accessibility tools that are beneficial to those with

30 disabilities. The contractor device **508** attempts to entice the supplier or supplier of

the accessibility tool with a general payment scheme that would apply to the given accessibility tool.

The controller **500** is further coupled to an intelligent agent system **501** that is composed of various intelligent agent software. One of the functions of the intelligent agent system **501** is to ensure that access to services was done with the help of services and accessibility tools that assist those with disabilities. The intelligent agent system **501** may find the manufacturers of the products that assist the people with disabilities through the tracking service device **503**. The intelligent agent system **501** may then store one or more of the indicators **507** to indicate the nature of the use of the accessibility tools.

While the exemplary embodiment shown in **Figure 5** is directed to an embodiment in which all of the devices **501-508** are present in a server of the data network, the invention is not limited to such an architecture. Rather one or more of the devices **501-508** may be distributed amongst a plurality of devices in the data network. For example, a first server may have devices **501** and **503-507** while a second server may have payment service **502**. Moreover, one or more of the devices **501-508** may be resident in an agent on the user's client device.

In operation, the accessibility service provider receives a request for content from a user's client device. The request includes an address of the content provider and the content requested, an identifier of the user or user's client device, and the like. This information may be provided in data packet headers, for example, of the request. Based on the user identifier, the controller **500** may identify the user's needs and abilities as well as the accessibility tool that should be used to provide the requested content to the user in a format that compensates for the user's needs and abilities. Such a determination may be made by looking-up the user in a registered user directory associated with the controller **500**, for example. Alternatively, the data packet header of the request may include an indicator of the user's needs and/or abilities.

Once the controller **500** has determined the required accessibility tool to be used with the requested content, the controller **500** redirects the user's request to a

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Yahoo banners through the screen reader website **602**. This is connected to the payment system server **604**. Through the payment system server **604** the provider of mirror website **602** receives a payment for each click that a user makes on banners on the website, or a percent from all the user's purchases on the website.

5 **Figure 7** gives another example of how the present invention may be used to provide accessibility service to a disabled person. In this example, a paralyzed person **700** is watching television **701** and controlling it with his voice through the Via Voice™ program **702**. Via Voice™ activates different channels on the television and allows for the watching of movies. For example, a movie **707** on channel **706** is
10 broadcast by a movie company **705**. The payment service **404, 604** monitors that the disabled person can watch the movie that is playing and makes sure that part of the payment for the movie goes to IBM **703** for providing the Via Voice™ service to the paralyzed person **700**.

15 The intelligent agent **711** that monitors this process may be in a personal computer **710** that may, through a network, **720** be connected to the Via Voice and to the television. The intelligent agent **711** monitors that these services are being provided correctly and communicates this to the payment service **704**. The personal computer **710** may be located in the user's room or somewhere else.

20 **Figure 8** illustrates the agreement database. Column **801** may contain the following information: Name of supplier (for example IBM) **802**, name of tools (for example Via Voice™ or Screen Reader™) **803**, a situation where these tools are used (for example watching TV or Browsing the Internet) **804**, time when these tools may be used **805**, a category of users (for example hearing impaired, visually impaired) **806**, the payment scheme (this includes contracts and agreements of other companies,
25 what percent of payment they agree to transfer to the supplier of accessibility tools) **807**, privacy issues (for example, high security for user's that do not want others to know that they are using accessibility tools **808**, and the names of individual users that may have agreements in the agreement database of the accessibility service provider that may also pay additional service fees **809**.

Figure 9 is an exemplary diagram illustrating how a contractor uses the agreement between the accessibility service provider and the provider of content according to payment scheme **807** in **Figure 8**. Module **900** contains the name of content that is being used. Module **901** is the general fee for access for

5 non-handicapped users. For example, if a non-handicapped user makes a click on an advertisement on a Yahoo web page, then part of the money goes to the provider of the advertisement. Module **903** contains the name of the supplier that provided access to the content. Module **902** is the percent of the fee from **901** that goes to the supplier **903**. For example, if Yahoo gets 1 cent for every click on a particular advertisement

10 on its web page, then, if the user is handicapped, then $\frac{1}{2}$ a cent goes to the provider of Screen Reader (because of Screen Reader™ a visually impaired person was able to click on the advertisement banner).

Figure 10 is a flowchart outlining an exemplary operation of the present invention. As shown in **Figure 10**, a request for content is received (step **1000**). A

15 determination is made as to whether the person requesting the content has a special need and/or different set of abilities, e.g., a disability or handicap (step **1001**). This determination may be made through an intelligent agent, for example. If the person requesting access does not have a special need and/or different set of abilities, then the access proceeds as usual (step **1002**). If it is determined that the person requesting

20 access to content does have a special need and/or set of abilities, then it is determined if the person is signed up for the accessibility service (what tools does the person use and what are the person's special needs and/or set of abilities)(step **1003**).

If the person is not signed up to the service then recommends that the person sign up for the accessibility service to easier serve the user in the future as well as

25 paying a supplier of an accessibility product or tool (step **1005**). If the person is signed up for the services then the system checks if the supplier of the accessibility tool being used is signed up with the accessibility Service (step **1004**). If the supplier is not signed up for the accessibility service then the system finds the supplier and recommends that the supplier sign up with the service (step **1007**). If the supplier of

30 the accessibility tool or service is signed up with the accessibility service, then the

system activates the payment scheme for this supplier (step 1006). In other words, a certain percent of the revenue generated because of the accessibility tool goes to the accessibility tool supplier or service provider.

Thus, the present invention provides a mechanism by which a supplier of an accessibility tool may provide the tool to disabled users on a per-use basis and receive a portion of the revenue obtained from the user of the accessibility tool. This provides the user with much needed tools to aid the user in obtaining access to content on the data network. In addition, the supplier is able to provide the accessibility tool at a relatively cheap cost to the supplier.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media, such as a floppy disk, a hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and transmission-type media, such as digital and analog communications links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions. The computer readable media may take the form of coded formats that are decoded for actual use in a particular data processing system.

The description of the present invention has been presented for purposes of illustration and description, and is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiments were chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.